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Stephanie Lindquist 04/05/02
Signature Date

#5 6/4/04

PATENT
13DV-13228

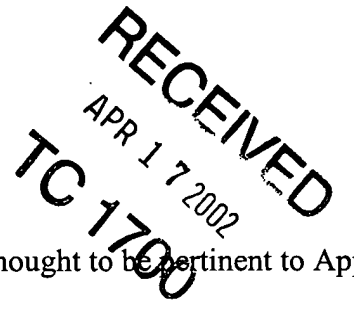
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Robert W. Bruce et al.	Examiner:	Rudy Zervigon
Serial No.:	09/624,810	Art Unit:	1763
Filed:	July 24, 2000		

For: ELECTRON BEAM PHYSICAL VAPOR DEPOSITION APPARATUS

INFORMATION DISCLOSURE STATEMENT IN
ACCORDANCE WITH 37 C.F.R. §§1.97 and 1.98

Assistant Commissioner for Patents
Washington, D.C. 20231



The following information is thought to be pertinent to Applicants' above-identified U.S. patent application, and is submitted at this time to comply with the requirements of 37 C.F.R. 1.56.

This paper is submitted in accordance with 37 CFR §1.97(c) (before final Office Action or Notice of Allowance, whichever is earlier). Please charge the $180 fee specified in 37 CFR §1.17(p) for submission of this Information Disclosure Statement to General Electric Company, Deposit Account No. 07-0865, in accordance with the attached Fee Transmittal form.

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CHRONOLOGY:

On January 26, 1996, General Electric Company ("Assignee"), the assignee of all rights in the invention disclosed in the above-identified patent application, entered into a "Production Alliance" with Praxair Surface Technologies, Inc. (Praxair), having a facility in Indianapolis, Indiana, which set forth an agreement by which Praxair would establish and operate a facility for depositing thermal barrier coatings (TBC) on gas turbine engine components using an electron beam physical vapor deposition (EBPVD) process performed by an EBPVD coater ("the coater"). The "Production Alliance" agreement set forth terms under which the Assignee would assist in funding the purchase of the coater.

By the spring of 1996, the Assignee made a scheduled payment to Praxair coinciding with the placement by Praxair of a purchase order for the coater.

Prior to September of 1996, Praxair presented a specification ("the Specification") to Leybold Systems Gmbh (Leybold), of Hanau, Germany, outlining the general operational requirements and delivery of components for the coater. The invention disclosed in the above-identified application was not described or specified in the Specification. The Specification was expressly stated as not being a purchase contract. The Specification was designated by Praxair as being "proprietary information" that cannot be publicized, reproduced or disseminated in any manner that would prove detrimental to Praxair. The Assignee honors this designation by not submitting the Specification herewith.

In September of 1996, representatives of the Assignee, Praxair and Leybold

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met for a mechanical design review, during which performance requirements for the mechanical components of the coater were discussed.

In February of 1997, representatives of the Assignee, Praxair and Leybold met for a software design review, during which requirements for the software used to operate and monitor the coater were discussed.

By the spring of 1997, the Assignee made a scheduled payment to Praxair coinciding with the acceptance by Praxair of coater components from Leybold. According to the Specification, the coater components were accepted on the basis of an "inspection at [Leybold's] plant." However, this inspection is set forth in the Specification as being "limited in scope because the coater will not be assembled, but function of motors, valves and part manipulating devices should be possible."

On February 9, 1998, a Source Substantiation Program Plan (SSPP) was issued by the Assignee to initiate a "source change" by which Praxair could be approved by the Assignee as a source for TBC coating for Assignee's gas turbine engine components.

In communications dated April 8 and May 15, 1998, representatives of the Assignee advised representatives of Praxair of certain critical process parameters required of the coater, including coating chamber pressures and temperatures.

Prior to July 23, 1998, training runs were performed at Praxair to evaluate the

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individual components of the assembled coater. Components were not processed.

According to the Specification, the coater was to be accepted on the basis of an "acceptance test at [Praxair's] plant [in Indianapolis, Indiana] to demonstrate that all technical functions and the software requirements stated in the specification are fulfilled and the evaporation is maintained over the reliability period." This test, initiated on July 23, 1998, was carried out with a Vendor Substantiation Evaluation (VSE) required for FAA certification of vendors that produce or process gas turbine engine components. The components coated during the VSE were CF6-80C Stage 1 turbine blades, GE Part No. 1538M90P12. These blades have cooling holes in their surfaces that must remain clear following coating to survive for an acceptable length of time in the hostile environment of a gas turbine engine. Coating was performed in a single "campaign" that consisted of a succession of multiple coating operations during which blades were coated in batches. Electron beam (EB) guns used to evaporate ingots of the coating material were continuously operated during the campaign to maintain molten pools of the coating material. Consequently, the coater was not allowed to cool down during the campaign.

On July 29, 1998, Praxair issued Invoice No. 587052 to the Assignee, coinciding with the shipment of the turbine blades coated during VSE. The shipment was made to the Assignee's facility in Madisonville, Kentucky, where the blades would begin an inspection to verify that the coater and its coating process produced acceptable coatings without damaging the blades.

On August 3, 1998, a second coating campaign was initiated with additional CF6-80C Stage 1 turbine blades.

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On August 7, 1998, a meeting was held at the Assignee's facility. The discussion included a concern for excessive change in air cooling flow resulting from the VSE coating operation. Reduced cooling flow was attributed to the coating parameters, including coating chamber pressure, ingot feed and evaporation rates, each of which affects or is affected by the operation of the EB guns used to evaporate ingots of the coating material. Engineering was able to resolve the concerns by the close of the meeting.

On August 12, 1998, a VSE test was initiated for FAA certification of nozzles for the CFM56 engine. Processing of the nozzles differed from the CF6 turbine blades in terms of, among other things, coating thickness and part motion within the coater. VSE's of various other gas turbine components continued to be performed with the coater for a period of about one year.

On September 9, 1998, the SSPP issued by the Assignee to initiate the "source change" for approving Praxair as a source for TBC coating of CF6-80C blades was signed-off by appropriate employees of the Assignee. The basis for the sign-off was the acceptance of the CF6-80C blades processed during VSE. As a result of this acceptance, the CF6-80C blades processed during VSE (and CF6-80C blades processed during subsequent campaigns) were able to be released to production.

On September 29, 1998, a second SSPP was issued by the Assigned to initiate a "process change" to approve a final revision to the procedure for the coater production operation at Praxair.

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On October 22, 1998, the "process change" SSPP was signed-off by appropriate employees of the Assignee.

Though the CF6-80C blades were accepted on September 9, 1998, on the basis of the VSE campaign, monitoring of the components of the coater itself continued well beyond September 9, 1998. Before their acceptance, pivotal issues for the coater components had to be resolved, including their long-term durability, which is entirely independent of the acceptance of the blades and required an extended experimental period.

On August 4, 1999, the Assignee filed the above-identified U.S. patent application.

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DISCUSSION:

The coater component that is the subject matter of the present application, U.S. Patent Application Serial No. 09/624,810, as well as coater components that are the subjects of related pending U.S. patent applications, are discussed below.

U.S. Patent Application Serial No. 09/624,810 (13DV-13228) discloses a pattern for an electron beam 28 generated by an electron beam (EB) gun of an EBPVD coater 10 and projected onto a ceramic ingot 26 within a crucible 56. The EB pattern optimizes evaporation and reduces spitting of the ingot 26, and cleans the surface 84 of the crucible 56 without excessive damage to the crucible 56. The EB pattern disclosed in the application was not described or specified in the Praxair Specification, and instead was developed independently by employees of the Assignee. The EB pattern was conceived by Assignee's employees in December 1997, programmed, installed and tested by Assignee's employees at Praxair's facility in March 1998, and evaluated during VSE (initiated on July 23, 1998). While the VSE evidenced the capability of the EB pattern to perform in a single campaign, engineering did not and could not conclude that the EB pattern disclosed in the application was effective for its intended purpose until approval of the VSE blades and/or crucible life was shown to meet previous levels (fall 1998).

Copending and related **U. S. Patent Application Serial No. 09/624,809 (13DV-13041)** discloses a method for using reflective members 72 and 80 to slow the temperature rise during a coating campaign of an EBPVD coater 10, and a gun orifice 68 for protecting the electron beam (EB) gun 30 from high pressures (≥0.010 mbar) sustained within the coating chamber 12 of the coater 10.

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The first "reflective member" 72 is positioned close to the parts at the beginning of a campaign and then moved away from the parts at some time later in the campaign. A much smaller version (12"x18") of the reflective member 72 was conceived in 1993-1994, designed in 1996, and subsequently employed in production coating processes at Assignee's facility in the U.S.A. The reflective member 72 disclosed in the application was not described or specified in the Praxair Specification. The reflective member 72 was fabricated by Leybold in Germany, installed at Praxair's facility in the spring of 1998, tested to demonstrate its ability to be actuated between two positions during pre-VSE trials, and finally evaluated during VSE (initiated on July 23, 1998).

The "second reflective member" (e.g., ceramic pieces) 80 is positioned around the crucible 56 to promote heating of components 20 early in the coating campaign, and then removed with a "manipulator arm" 77 at some time later in the campaign to minimize part temperature. The second reflective member 80 and the manipulator arm 77 were not described or specified in the Praxair Specification. The second reflective member 80 was conceived in 1993-1994. A drawing of the manipulator arm 77 disclosed in the application existed in 1996. The manipulator arm 77 was fabricated by Leybold, installed at Praxair's facility in the spring of 1998, and tested during pre-VSE trials. The second reflective member 80 was evaluated during VSE (initiated on July 23, 1998).

The gun orifice 68 was conceived in 1997, designed in January 1998, fabricated in February 1998, and installed for use in a production coating process at the Assignee's facility in May 1998. The gun orifice 68 was also installed at Praxair's facility in the spring of 1998, and evaluated during VSE (initiated on July 23, 1998).

Engineering concluded that the second reflective member 80, the reflective member 72, and the two-position method disclosed for the reflective member 72 were effective for their intended purposes in September 1998, after the conclusion of the VSE.

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However, while the VSE evidenced the capability of the gun orifice 68 to protect the gun at high pressures (≥0.010 bar) over a single campaign, engineering did not and could not conclude that the gun orifice 68 disclosed in the application was effective for its intended purpose until life of the EB gun 30 was shown to meet acceptable levels (4000 mm of ingot, or about 10-12 campaigns). This capability was determined not earlier than October 1998 at Praxair's facility, and not earlier than November 1998 at the Assignee's facility.

Copending and related **U.S. Patent Application Serial No. 09/621,755 (13DV-13220)** discloses a method and "second chamber" 64 to further protect the EB gun 30 from high pressures (≥0.010 bar) sustained within the coating chamber 12. The second chamber 64 protects the EB gun 30 by providing a region between the coating chamber 12 and the gun 30 where an intermediate pressure is maintained (lower than the coating chamber 12). The second chamber 64 disclosed in the application was not described or specified in the Praxair Specification. The second chamber 64 was fabricated by Leybold in Germany, installed at Praxair's facility in the spring of 1998, and evaluated during VSE (initiated on July 23, 1998). While the VSE evidenced the capability of the second chamber 64 to protect the gun at high pressures (≥0.010 bar) over a single campaign, engineering did not and could not conclude that the second chamber 64 disclosed in the application was effective for its intended purpose until life of the EB gun 30 was shown to meet acceptable levels (4000 mm of ingot, or about 10-12 campaigns). This capability was determined in October of 1998.

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Copending and related **U.S. Patent Application Serial No. 09/621,758 (13DV-13221)** discloses low-profile movable platforms 24 supported by bearings 44

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embedded in the floor of the facility. The platforms 24 were not described or specified in the Praxair Specification. The platforms 24 were fabricated by Leybold in Germany, installed at Praxair's facility during the fall and winter of 1997, tested during pre-VSE trials, and evaluated during VSE (initiated on July 23, 1998).

Copending and related **U.S. Patent Application Serial No. 09/621,754 (13DV-13222)** discloses a control panel 118. The panel 118 was not described or specified in the Praxair Specification. The panel 118 was fabricated by Leybold in Germany, installed at Praxair's facility through the fall-spring of 1997-98, used during pre-VSE trials, and evaluated during VSE (initiated on July 23, 1998).

Copending and related **U.S. Patent Application Serial No. 09/624,808 (13DV-13225)** discloses a two-piece crucible 56 constructed to have thin walls to maximize cooling effectiveness. The crucible 56 disclosed in the application was not described or specified in the Praxair Specification. The crucible 56 was fabricated by the Assignee, installed at Praxair's facility in the spring of 1998, and evaluated during VSE (initiated on July 23, 1998). While the VSE evidenced the capability of the crucible 56 to survive a single campaign, engineering did not and could not conclude that the crucible 56 disclosed in the application was effective for its intended purpose until crucible life was shown to meet previous levels (35,000 coated parts), achieved during the fall of 1998.

Copending and related **U.S. Patent Application Serial No. 09/621,756 (13DV-13226)** discloses a two-carousel, multi-sleeve magazine 102 having the ability to move toward and away from each other, and equipped with a jam-free clamping system

60. The magazine 102 was not described or specified in the Praxair Specification. The magazine 102 was fabricated by Leybold in Germany, installed at Praxair's facility through the summer and fall of 1997, used during pre-VSE trials, and evaluated during VSE (initiated on July 23, 1998).

Copending and related **U.S. Patent Application Serial No. 09/621,757 (13DV-13227)** discloses a viewport 48 having a stroboscopic drum 112 to provide an operator with a stereoscopic view of the coating chamber 12. The viewport 48 further includes cooling flow and a magnetic particle seal. The viewport 48 was not described or specified in the Praxair Specification. The viewport 48 was originally fabricated by Leybold in Germany without the magnetic particle seal. The viewport 48 was installed at Praxair's facility in the spring of 1998, at which time the magnetic particle seal was added by employees of the Assignee. The modified viewport 48 was then used during pre-VSE trials and evaluated during VSE (initiated on July 23, 1998).

CLOSING:

As stated above, the Assignee filed each of the above-identified U.S. patent applications on August 4, 1999. Consequently, the applications were filed more than one year after the fabrication, purchase and installation of the inventions disclosed in the applications, and more than one year after the initiation of the VSE to evaluate the coater and its components, but less than one year from the date on which the acceptability of the blades processed by the coater was established, and less than one year from the date on which the acceptability of various components of the coater was established.

The Assignee believes the VSE required for certification was primarily experimental - "a bona fide effort . . . to ascertain whether [the invention] will answer its intended purpose" with "any commercial exploitation [being] merely incidental" - and therefore a permitted activity under both the "public use" and "on sale" rules. *LaBounty Mfg. v. United States Int'l Trade Comm'n*, 22 USPQ2d 1025, 1028 (Fed. Cir. 1992) (quoting *Pennwalt Corp. v. Akzona Inc.*, 222 USPQ 833, 838 (Fed. Cir. 1984). An "actual reduction to practice" occurs at the conclusion of "perfecting or completing an invention to the point of determining that it will work for its intended purpose." *RCA Corp. v. Data Gen. Corp.* 12 USPQ2d 1449 (1989).

The Assignee submits that an actual reduction to practice of the coater could not have occurred before the meeting of August 7, 1998, during which engineering concerns for the coating procedure were finally resolved, and did not occur before September 9, 1998, when final sign-off occurred of the SSPP issued by the Assignee to

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initiate the "source change" for approving Praxair as a source for TBC coating of CF6-80C blades.

Respectfully submitted,

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